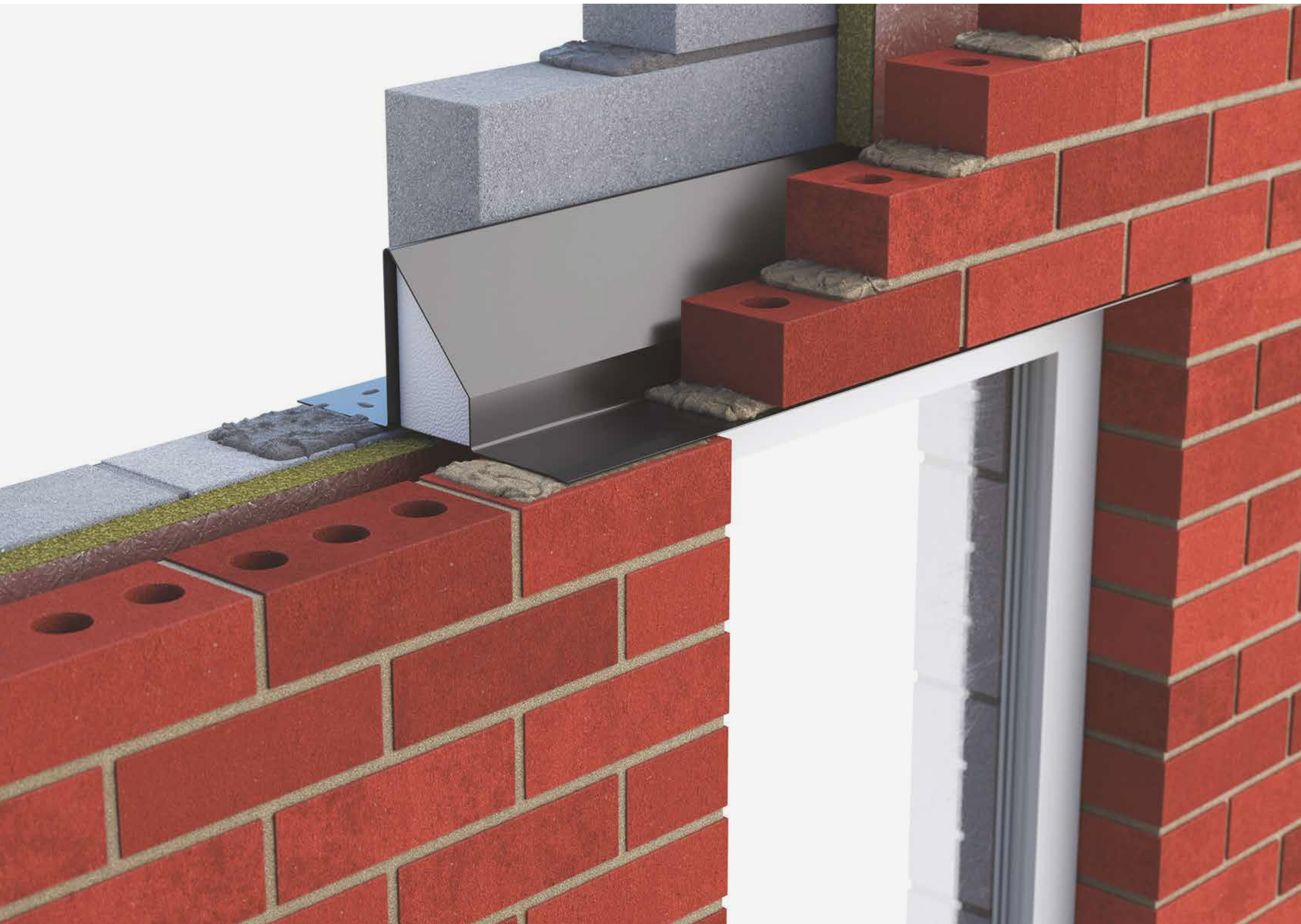
A Tata Steel Enterprise

THIRD PARTY VERIFIED ISO 14025 & EN 15804

Catnic® Lintel CG90/1001500

Environmental Product Declaration

Owner of the Declaration: Tata Steel Europe
Programme Operator: Tata Steel UK Limited, 18 Grosvenor Place, London, SW1X 7HS



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Catnic® Lintel CG90/1001500
Environmental Product Declaration
(in accordance with ISO 14025 and EN 15804)

This EPD is representative and valid for the specified (named) product

Declaration Number: EPD-TS-2022-007
Date of Issue: 19th April 2022
Valid until: 18th April 2027

Owner of the Declaration: Tata Steel Europe
Programme Operator: Tata Steel UK Limited, 18 Grosvenor Place, London, SW1X 7HS

The CEN standard EN 15804:2012+A2:2019 serves as the core Product Category Rules (PCR) supported by Tata Steel's EN 15804 verified EPD PCR documents

Independent verification of the declaration and data, according to ISO 14025 Internal

Internal ☐ External ☒

Author of the Life Cycle Assessment: Tata Steel UK
Third party verifier: Chris Foster, Eugeos Ltd.

1 General information

Owner of EPD	Tata Steel Europe
Product & module	Catnic® CG90/1001500 steel lintel for cavity wall construction
psi value	typically 0.18W/mK (subject to wall construction)
Manufacturer	Catnic (a Tata Steel Enterprise)
Manufacturing sites	Caerphilly, Moerdijk, IJmuiden, Shotton, Llanwern and Port Talbot
Product applications	Construction
Declared unit	1.5m long insulated steel lintel
Date of issue	19th April 2022
Valid until	18th April 2027

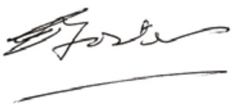
EPD
THIRD PARTY VERIFIED ISO 14025 & EN 15804

This Environmental Product Declaration (EPD) is for a 1.5m long Catnic® CG90/100 steel lintels for cavity wall construction manufactured by Catnic, a Tata Steel Enterprise in the UK. The environmental indicators are for products manufactured at Caerphilly with feedstock supplied from Moerdijk and Shotton. Data for other CG lintel products is available at www.catnic.com/epd

The information in this Environmental Product Declaration is based on production data from 2016, 2017 and 2019.

EN 15804 serves as the core PCR, supported by Tata Steel's EN 15804 verified EPD programme Product Category Rules documents, and this declaration has been independently verified according to ISO 14025 [1,2,3,4,5,6,7].

Third party verifier



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2 Product information

2.1 Product Description

The Catnic® CG90/1001500 is part of a range of insulated steel lintels for use in standard cavity wall construction, and designed to support typical masonry, timber floor and roof loads found in most buildings. Suitable for fairfaced inner leaf masonry, the easy to use open back profile allows masonry to be built up continuously on both outer and inner leaf. The CG90/1001500 lintels are manufactured from hot dipped galvanised steel to EN 10346 [8] with a coating of thermal setting polyester powder (Duplex Corrosion Protection) applied by an electrostatic process, further protecting the lintel. This coating provides a tough durable surface that is highly resistant to impact, abrasion and damage during on-site handling.

Catnic® lintels offer a unique profile shape that combines with the unique Duplex Corrosion Protection to create an effective barrier that acts as a built-in Damp Proof Course, meaning any water penetrating into the cavity automatically transfers across the sloping face of the lintel and is disposed of externally.

Catnic® CG90/1001500 lintels are supplied fully insulated and this insulation is accurately shaped to optimise the thermal performance extending continuously along the full length of the lintel. It is firmly fixed in position and means there are no potential 'cold spots'. The CG90/1001500 lintel range has no base plate, minimising cold bridging at the window head, and comes complete with an integral plaster key.

An image of the product is shown in Figure 1 below.

Figure 1 Catnic® CG90/1001500 lintel

2.2 Manufacturing

The manufacturing sites included in the EPD are listed in Table 1 below.

Table 1 Participating sites

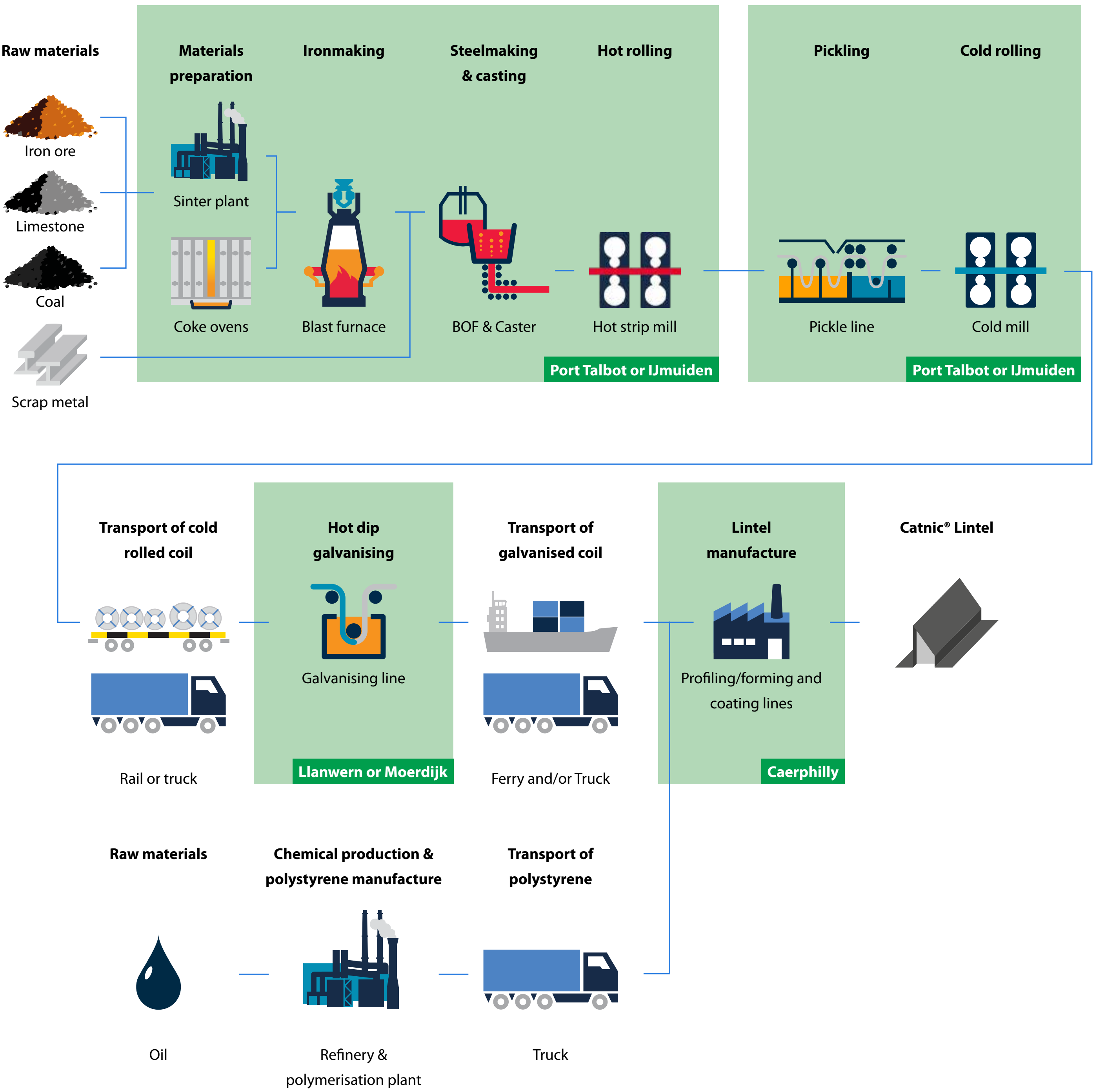
Site name	Product	Manufacturer	Country
Port Talbot	Cold rolled coil	Tata Steel	UK
Llanwern	Galvanised coil	Tata Steel	UK
IJmuiden	Cold rolled coil	Tata Steel	NL
Moerdijk	Galvanised coil	Wuppermann	NL
Caerphilly	Insulated steel lintels	Catnic	UK

The process of lintel manufacture at Tata Steel begins with sinter being produced from iron ore and limestone, and together with coke from coal, reduced in a blast furnace to produce iron. Steel scrap is added to the liquid iron and oxygen is blown through the mixture to convert it into liquid steel in the basic oxygen furnace. The liquid steel is continuously cast into discrete slabs, which are subsequently reheated and rolled in a hot strip mill to produce steel coil.

The hot rolled coils are pickled and cold rolled, and in the UK, are transported by rail from Port Talbot to Llanwern, where the strip is galvanised on the Zodiac Line. In the Netherlands, the cold rolled coils are transported by inland waterway from IJmuiden to the Wuppermann plant at Moerdijk where they are galvanised.

The galvanised coils are transported to the Caerphilly site in South Wales by road from Llanwern, and by inland waterway, road and ship from Moerdijk. The manufacturing process at Caerphilly begins with the coils being slit, cut to length and perforated, before the steel sheets are folded or formed to create the lintel profile. The brackets are fitted and the whole assembly is powder coated using an electrostatic process, prior to the expanded polystyrene insulation being incorporated. An overview of the process from raw materials to lintel product is shown in Figure 2.

Figure 2 Process overview from raw materials to lintel product



Process data for the manufacture of cold rolled coil at IJmuiden and hot dip galvanised coil at Llanwern was gathered as part of the latest worldsteel data collection. Process data was also gathered for the hot dip galvanising process at Moerdijk and for the lintel manufacturing process at Caerphilly.

2.3 Technical data and specifications

The general properties of the product are shown in Table 2, and the technical specifications of the product are presented in Table 3. The structural data published in the loading tables (Table 2) has been achieved in accordance with EN 845-2 [9] and SWL (Safe Working Load) defined by BS 5977 [10] for cavity wall lintels refers to uniform distributed loads applied in the inner to outer leaf ratios as follows.

- 1:1 for lintels supporting masonry
- 3:1 for lintels normally carrying timber floors

A lintel should not exceed a maximum vertical deflection of 0.003 multiplied by the effective span (effective span = distance between centre of bearings) when subjected to the safe working load (SWL).

Table 2 General properties of Catnic® Lintels

	Catnic® CG90/1001500 lintel
Lintel length (mm)	1500
SWL (kN)	15
Weight (kg)	10.06
Nominal height 'h' (mm)	140

Table 3 Technical specification of Catnic® Lintels

	Catnic® CG90/1001500 lintel
Metallic Coating	CG90/1001500 lintels are manufactured from hot dip galvanised steel to EN 10346 [8] plus coating type Z275
Duplex Corrosion Protection	The CG90/1001500 lintel coating is fully compliant with the chemical and physical test requirements of BS 5977 [10] and EN 845-2 [9] for lintels that effectively have their own built-in damp proof course
Continuous Insulation	CG90/1001500 lintels are supplied with CFC and HCFC free expanded polystyrene insulation to maximise thermal efficiency and compliance with Part L [11]
Certification	Certifications applicable to the Caerphilly site are; ISO 9001 [12], ISO 14001 [13], BBA certification (Catnic®) [14], BES 6001 certification [15], Fully Part L Compliant (Parts L1 & L2) [11], NHBC technical requirements [16], LABC compliant [17] Declaration of Performance to EN 845-2 [9]

2.4 Packaging

Catnic® lintels are supplied in packs banded onto timber bearers. The mass of this packaging is 0.035kg of timber and 0.0023kg of steel strapping, per kg of lintel product.

2.5 Reference service life

A reference service life for Catnic® lintels is not declared. However, the lintels have been independently assessed and approved by the British Board of Agrément (BBA) [14] against the requirements outlined in harmonised European Standard EN 845-2 [9] and relevant Building Regulations. The BBA make a statement on their certificate on the durability of Catnic® Lintels which is 'provided that the systems are designed, installed and used in accordance with the Certificate, they will have a service life of at least 60 years'.

Copies of the relevant BBA certificates are available at https://catnic.com/downloads

2.6 Biogenic Carbon content

There are no materials containing biogenic carbon in Catnic® lintel products. Timber bearers are used to package the lintel products and comprise a significant mass of the total packaging as shown in Table 4 below.

Table 4 Biogenic carbon content at the factory gate

	Catnic® CG90/1001500 lintel
Biogenic carbon content (product) (kg)	0
Biogenic carbon content (packaging) (kg)	0.18

Note: 1kg biogenic carbon is equivalent to 44/12kg of CO_2

3 LCA methodology

3.1 Declared unit

The unit being declared is a 1.5m length lintel product and the material composition of the lintel is detailed in Table 5.

3.2 Scope

This EPD can be regarded as Cradle-to-Gate (with options) and the modules considered in the LCA are;

A1-A3: Production stage (raw material supply, transport to production site, manufacturing)
A4-A5: Construction stage (transport to construction site, construction site installation)
B1-B5: Use stage (related to the building fabric including maintenance, repair, replacement)
C1-C4: End-of-life (demolition/deconstruction, transport, processing for recycling and disposal)
D: Reuse, recycling and recovery

The life cycle stages are explained in more detail in Figure 3, but where the text is in light grey, the impacts from this part of the life cycle are not considered for this particular product.

Table 5 Material composition of CG90/1001500 lintel per declared unit

	Material declaration
Declared unit (m)	1.5
Insulation (kg)	0.20
Steel (including brackets) (kg)	9.78
Coating (kg)	0.08

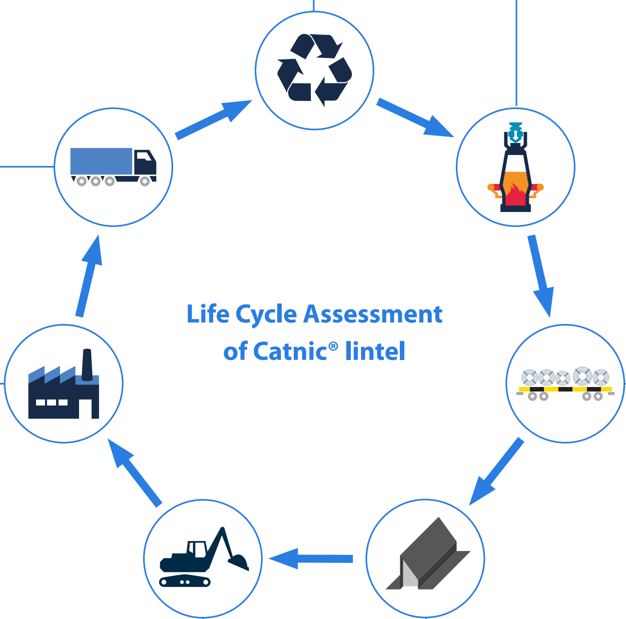
Figure 3 Life Cycle Assessment of Catnic® CG90/1001500 lintel

Module D: Benefits & loads beyond the system boundary
Includes impacts from;
- Lintel reuse (5%) and recycling of the steel component (93%)

Module C: End-of-life stage
Includes impacts from:
- Deconstruction of insulated steel lintel
- Transport from site to end-of-life
- Processing of lintel for reuse or recycling
- Disposal to landfill of steel (2%) and EPS insulation (95%)

Module B: Use stage
Includes impacts from;
- Use or application of the insulated steel lintel on a building
- Maintenance, repair, replacement, refurbishment of the lintel

Modules A4 & A5: Construction process stage
Includes impacts from;
- Delivery of lintel to site
- Installation of insulated steel lintel at construction site



Module A1: Product stage (primary processing)
Includes impacts from;
- Raw material extraction and processing (iron ore, coal)
- Steelmaking, casting, and production of cold rolled coil at IJmuiden / Port Talbot
- Preparation of recycled scrap
- Hot dip metallic coating at Moerdijk & Llanwern
- Responsible sourcing of materials to BES 6001 standard

Module A2: Product stage (transport)
Includes impacts from;
- Transport of cold rolled coil from IJmuiden to Moerdijk & from Port Talbot to Llanwern
- Transport of galvanised coil from Moerdijk & Llanwern to Caerphilly

Module A3: Product stage (panel system manufacture)
Includes impacts from;
- Profiling/forming of lintel and brackets from galvanised steel
- Manufacture of powder for coating and of EPS for insulation

3.3 Cut-off criteria

All information from the data collection process has been considered, covering all used and registered materials, and all fuel and energy consumption. On-site emissions was measured and those emissions have been considered. Data for all relevant sites were thoroughly checked and also cross-checked with one another to identify potential data gaps. No processes, materials or emissions that are known to make a significant contribution to the environmental impact of the lintel have been omitted. On this basis, there is no evidence to suggest that input or outputs contributing more than 1% to the overall mass or energy of the system, or that are environmentally significant, have been omitted. It is estimated that the sum of any excluded flows contribute less than 5% to the impact assessment categories. The manufacturing of required machinery and other infrastructure is not considered in the LCA.

3.4 Background data

For life cycle modelling of insulated steel lintels, the GaBi Software System for Life Cycle Engineering is used [18]. The GaBi database contains consistent and documented datasets which can be viewed in the online GaBi documentation [19].

Where possible, specific data derived from Tata Steel's own production processes were the first choice to use where available.

To ensure comparability of results in the LCA, the basic data of the GaBi database were used for energy, transportation and auxiliary materials.

3.5 Data quality

The data from Tata Steel's own production processes are from 2016, 2017 and 2019, and the technologies on which these processes were based during that period, are those used at the date of publication of this EPD. All relevant background datasets are taken from the GaBi software database, and the last revision of these datasets took place less than 10 years ago. The study is considered to be based on good quality data.

3.6 Allocation

To align with the requirements of EN 15804, a methodology is applied to assign impacts to the production of slag and hot metal from the blast furnace (co-products from steel manufacture), that was developed by the World Steel Association and EUROFER [20]. This methodology is based on physical and chemical partitioning of the manufacturing process, and therefore avoids the need to use allocation methods, which are based on relationships such as mass or economic value. It takes account of the manner in which changes in inputs and outputs affect the production of co-products and also takes account of material flows that carry specific inherent properties. This method is deemed to provide the most representative method to account for the production of blast furnace slag as a co-product.

Economic allocation was considered, as slag is designated as a low value co-product under EN 15804. However, as neither hot metal nor slag are tradable products upon leaving the blast furnace, economic allocation would most likely be based on estimates. Similarly BOF slag must undergo processing before being used as a clinker or cement substitute. The World Steel Association and EUROFER also highlight that companies purchasing and processing slag, work on long term contracts which do not follow regular market dynamics of supply and demand.

Process gases arise from the production of the continuously cast steel slabs at Port Talbot and IJmuiden, and are accounted for using the system expansion method. This method is also referenced in the same EUROFER document and the impacts of co-product allocation, during manufacture, are accounted for in the product stage (module A1).

End-of-life assumptions for recovered steel and steel recycling are accounted for as per the current methodology from the World Steel Association 2017 Life Cycle Assessment methodology report [21]. A net scrap approach is used to avoid double accounting, and the net impacts are reported as benefits and loads beyond the system boundary (module D).

3.7 Additional technical information

The main scenario assumptions used in the LCA are detailed in Table 6. The end-of-life percentages are taken from a Tata Steel / EUROFER recycling and reuse survey of UK demolition contractors carried out in 2012 [22].

For all indicators the characterisation factors from the EC-JRC are applied, identified by the name EN_15804, and based upon the EF Reference Package 3.0 [23]. In GaBi, the corresponding impact assessment is used, denoted by EN 15804 +A2.

3.8 Comparability

Care must be taken when comparing EPDs from different sources. EPDs may not be comparable if they do not have the same functional unit or scope (for example, whether they include installation allowances in the building), or if they do not follow the same standard such as EN 15804. The use of different generic data sets for upstream or downstream processes that form part of the product system may also mean that EPDs are not comparable.

Comparisons should ideally be integrated into a whole building assessment, in order to capture any differences in other aspects of the building design that may result from specifying different products. For example, a more durable product would require less maintenance and reduce the number of replacements and associated impacts over the life of the building, or, a higher strength product may require less material for the same function.

Table 6 Main scenario assumptions

Module	Scenario assumptions
A1 to A3 – Product stage	Manufacturing data from Tata Steel's site(s) at Port Talbot, Llanwern and IJmuiden is used, together with data from Wuppermann Staal in Moerdijk.
A2 – Transport to the galvanising and lintel manufacturing sites	Cold rolled coils are transported from IJmuiden to Moerdijk, a distance of 150km by inland waterway on a 3000 tonne capacity canal barge with a utilisation of 55%. The Catnic® lintel manufacturing facility is located at Caerphilly in South Wales and the galvanised coils are transported there from Moerdijk, a total distance of 1357km by inland waterway, road and for most of the distance, by sea on a 2200 DWT bulk carrier with a utilisation of 93%. Other galvanised coils are transported to Caerphilly, a distance of 30km from Llanwern and an average of 117km from UK steel stockholders, by road on a 26 tonne capacity truck with a utilisation of 46% to allow for empty returns. Transport of insulation and coating powder are also included.
A4 – Transport to construction site	A transport distance of 225km by road on a 26 tonne capacity truck was considered representative of a typical installation. A utilisation factor of 58% was assumed.
A5 – Installation at construction site	The impact from installation of the lintels on site was assumed to be zero because they are sufficiently light to be manually lifted into position, and there is no loss from damage to lintels during installation. Any packaging is assumed to be reused or recycled.
B1 to B7 – Use stage	This stage includes any maintenance or repair, replacement or refurbishment of the lintels over the life cycle. This is not required for the duration of the life of the lintels.
C1 – Deconstruction and demolition	The deconstruction impacts are also assumed to be zero because the lintels can be manually removed from the building at end-of-life.
C2 – Transport for recycling, reuse, and disposal	A total transport distance of 150km to landfill is assumed, while a distance of 225km is assumed for reuse. For the steel component that is recycled, a total distance of 200 km to the steel plant via a shredding plant is assumed. All transport is on a 26 tonne capacity truck with the following utilisations assumed to account for empty returns – transport of lintel 0.20, transport of insulation only 0.05, transport of shredded steel scrap 0.30.
C3 – Waste processing for reuse, recovery and/or recycling	The lintels that are recycled are processed in a shredder. There is no additional processing of material for reuse.
C4 - Disposal	At end-of-life, 2% of the steel and 95% of the EPS insulation is disposed in a landfill, based upon the findings of an NFDC survey.
D – Reuse, recycling, and energy recovery	At end-of-life, 93% of the steel is recycled and 5% of the lintels (steel and insulation) are reused, based upon the findings of an NFDC survey.

Please note that in the GaBi software, an empty return journey is accounted for by halving the load capacity utilisation of the outbound journey.

4 Results of the LCA

Description of the system boundary

Product stage			Construction stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse Recovery Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	X	X	ND	ND	X	X	X	X	X

X = Included in LCA; ND = module not declared

Environmental impact:

CG90/1001500 insulated steel lintel

Parameter	Unit	A1 – A3	A4	A5	B	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	2.93E+01	1.44E-01	0.00E+00	0.00E+00	0.00E+00	3.92E-01	1.13E-01	5.57E-03	-1.65E+01
GWP-fossil	kg CO_2 eq	2.98E+01	1.46E-01	0.00E+00	0.00E+00	0.00E+00	3.96E-01	1.13E-01	5.73E-03	-1.65E+01
GWP-biogenic	kg CO_2 eq	-5.91E-01	-1.37E-03	0.00E+00	0.00E+00	0.00E+00	-3.69E-03	-1.05E-03	-1.70E-04	2.10E-02
GWP-luluc	kg CO_2 eq	5.98E-03	2.03E-06	0.00E+00	0.00E+00	0.00E+00	5.49E-06	5.37E-04	1.06E-05	-6.27E-04
ODP	kg CFC11 eq	4.09E-11	1.90E-14	0.00E+00	0.00E+00	0.00E+00	5.15E-14	2.58E-12	1.35E-14	-2.08E-12
AP	mol H^+ eq	6.94E-02	4.69E-04	0.00E+00	0.00E+00	0.00E+00	1.51E-03	3.65E-04	4.06E-05	-3.02E-02
EP-freshwater	kg P eq	1.29E-05	2.93E-08	0.00E+00	0.00E+00	0.00E+00	7.93E-08	3.93E-07	9.71E-09	-3.91E-06
EP-marine	kg N eq	1.80E-02	2.22E-04	0.00E+00	0.00E+00	0.00E+00	7.28E-04	6.77E-05	1.04E-05	-6.06E-03
EP-terrestrial	mol N eq	1.89E-01	2.44E-03	0.00E+00	0.00E+00	0.00E+00	8.00E-03	7.24E-04	1.14E-04	-6.15E-02
POCP	kg NMVOC eq	6.76E-02	4.36E-04	0.00E+00	0.00E+00	0.00E+00	1.40E-03	1.94E-04	3.16E-05	-2.64E-02
ADP-minerals&metals	kg Sb eq	3.68E-04	9.08E-09	0.00E+00	0.00E+00	0.00E+00	2.46E-08	4.07E-08	5.87E-10	-5.57E-05
ADP-fossil	MJ net calorific value	3.57E+02	1.92E+00	0.00E+00	0.00E+00	0.00E+00	5.19E+00	2.29E+00	7.50E-02	-1.65E+02
WDP	m^3 world eq deprived	5.88E+00	1.90E-04	0.00E+00	0.00E+00	0.00E+00	5.14E-04	2.21E-02	6.28E-04	-4.12E+01
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND	ND
IRP	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP		ND	ND	ND	ND	ND	ND	ND	ND	ND

GWP-total = Global Warming Potential total
GWP-fossil = Global Warming Potential fossil fuels
GWP-biogenic = Global Warming Potential biogenic
GWP-luluc = Global Warming Potential land use and land use change
ODP = Depletion potential of stratospheric ozone layer
AP = Acidification potential, Accumulated Exceedance
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment
EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment
EP-terrestrial = Eutrophication potential, Accumulated Exceedance
POCP = Formation potential of tropospheric ozone
ADPE = Abiotic depletion potential for non-fossil resources
ADPF = Abiotic depletion potential for fossil resources
WDP = Water (user) deprivation potential, deprivation-weighted water consumption
PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235
ETP-fw = Potential Comparative Toxic Unit for ecosystems
HTP-c = Potential Comparative Toxic Unit for humans
HTP-nc = Potential Comparative Toxic Unit for humans
SQP = Potential soil quality index

The following indicators should be used with care as the uncertainties on these results are high or as there is limited experience with the indicator : ADP-minerals&metals, ADP-fossil, and WDP.

Resource use:

CG90/1001500 insulated steel lintel

Parameter	Unit	A1 – A3	A4	A5	B	C1	C2	C3	C4	D
PERE	MJ	2.28E+01	7.67E-02	0.00E+00	0.00E+00	0.00E+00	2.08E-01	6.55E-01	1.13E-02	8.10E+00
PERM	MJ	5.96E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.98E-01
PERT	MJ	2.88E+01	7.67E-02	0.00E+00	0.00E+00	0.00E+00	2.08E-01	6.55E-01	1.13E-02	7.80E+00
PENRE	MJ	3.46E+02	1.93E+00	0.00E+00	0.00E+00	0.00E+00	5.22E+00	2.29E+00	7.51E-02	-1.64E+02
PENRM	MJ	1.07E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.37E-01
PENRT	MJ	3.57E+02	1.93E+00	0.00E+00	0.00E+00	0.00E+00	5.22E+00	2.29E+00	7.51E-02	-1.65E+02
SM	kg	3.85E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.53E-01	1.15E-05	0.00E+00	0.00E+00	0.00E+00	3.11E-05	9.43E-04	1.91E-05	-9.62E-01

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM = Use of renewable primary energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM = Use of non-renewable primary energy resources used as raw materials
PENRT = Total use of non-renewable primary energy resources
SM = Input of secondary material
RSF = Use of renewable secondary fuels
NRSF = Use of non-renewable secondary fuels
FW = Use of net fresh water

Output flows and waste categories:

CG90/1001500 insulated steel lintel

Parameter	Unit	A1 – A3	A4	A5	B	C1	C2	C3	C4	D
HWD	kg	1.47E-02	5.02E-12	0.00E+00	0.00E+00	0.00E+00	1.36E-11	2.10E-08	3.86E-12	-7.33E-04
NHWD	kg	1.00E+00	1.53E-04	0.00E+00	0.00E+00	0.00E+00	4.15E-04	1.26E-03	7.68E-01	1.82E+00
RWD	kg	2.76E-03	3.03E-06	0.00E+00	0.00E+00	0.00E+00	8.21E-06	2.91E-04	8.36E-07	-1.22E-04
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-01	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	2.33E-02	0.00E+00	0.00E+00	0.00E+00	9.36E+00	0.00E+00	0.00E+00
MER	kg	3.71E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.86E-04
EEE	MJ	1.77E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.86E-04
EET	MJ	6.13E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.07E-04

HWD = Hazardous waste disposed
NHWD = Non-hazardous waste disposed
RWD = Radioactive waste disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported electrical energy
EET = Exported thermal energy

5 Interpretation of results

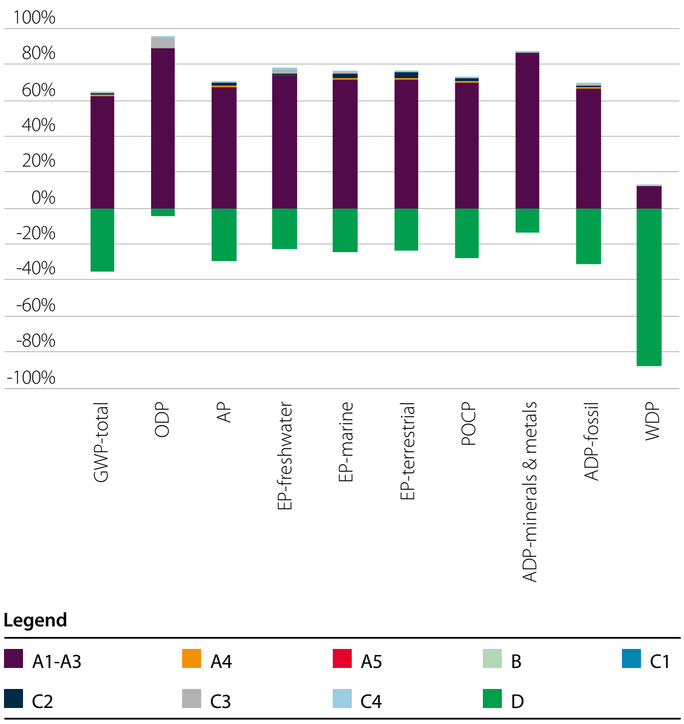
Figure 4 shows the relative contribution per life cycle stage for selected environmental impact categories for a Catnic® CG90/1001500 lintel. Each column represents 100% of the total impact score, which is why all the columns have been set with the same length. A burden is shown as positive (above the 0% axis) and a benefit is shown as negative (below the 0% axis). The main contributors across the impact categories are A1-A3 (burdens) and D (benefits beyond the system boundary). The manufacture of hot dip galvanised coil during stage A1-A3 is responsible for at least 90% of each impact in most of the categories, specifically, the conversion of iron ore into liquid steel which is the most energy intensive part of the overall lintel manufacturing process.

The primary site emissions come from the use of coal and coke in the blast furnace, and from the injection of oxygen into the basic oxygen furnace, as well as combustion of the process gases. These processes give rise to emissions of CO_2, which contributes more than 90% of the Global Warming Potential (GWP), and sulphur oxides, which are responsible for 53% of the impact in the Acidification Potential (AP) category. In addition, oxides of nitrogen are emitted which contribute 46% of the A1-A3 Acidification Potential, almost all of the Eutrophication Potential (EP-marine and EP-terrestrial), and approximately 60% of the Photochemical Ozone indication (POCP). Sulphur dioxide and carbon monoxide emissions also contribute to POCP, as does the emission of pentane from the expansion of the insulating PS bead (15%). The contributions to the EP-freshwater indicator are mainly phosphate and phosphorous emissions across all processes.

Figure 4 clearly indicates the relatively small contribution to each impact from the other life cycle stages, which are A4, A5 and C1 to C4. The most notable of these are for the EP-marine and EP-terrestrial indicators in the transport stages A4 and C2, from nitrogen oxides to air from the combustion of diesel fuel, and for the ODP category in C3, as a result of the shredding process which prepares the recovered steel lintel for recycling. The reference year of the processing for recycling data is 2000, but its inclusion in the model was deemed to be better than not considering these impacts at all.

Module D values are largely derived using worldsteel's value of scrap methodology which is based upon many steel plants worldwide, including both BF/BOF and EAF steel production routes. At end-of-life, the recovered steel is modelled with a credit given as if it were re- melted in an Electric Arc Furnace and substituted by the same amount of steel produced in a Blast Furnace [21]. The specific emissions that represent the burden in A1-A3, are essentially the same as those responsible for this Module D credit. It is important that the life cycle of the steel product is considered here, because in most cases, the Module D credit provides significant benefits in terms of reducing the whole life environmental impacts.

Figure 4 LCA results for Catnic® CG90/1001500 lintel



It is worth noting that for both the water deprivation potential indicator (WDP) and the use of net fresh water category (see results tables), Module D is a benefit, but the magnitude of this benefit is greater than the impact from Modules A1-A3. This is highlighted by the rightmost bar in Figure 4 and is explained by the Module D benefit for the two water indicators being based upon the worldsteel calculation mentioned previously. Port Talbot and IJmuiden, the biggest water users in this study, are both relatively modest users of fresh water as reported in A1-A3. The worldwide average calculation for Module D includes many sites with considerably greater fresh water use in A1-A3 than either Port Talbot or IJmuiden.

Referring to the LCA results, the impact in Module D for the Use of Renewable Primary Energy indicator (PERT) is different to the other impact categories, being a burden or load rather than a benefit. Renewable energy consumption is strongly related to the use of electricity, during manufacture, and as the recycling (EAF) process uses significantly more electricity than primary manufacture (BF/BOS), there is a positive value for renewable energy consumption in Module D but a negative value for non-renewable energy consumption.

6 References and product standards

1. Tata Steel's EN 15804 verified EPD programme, General programme instructions, V2 January 2022

2. Tata Steel's EN 15804 verified EPD programme, Product Category Rules Part 1, V2 January 2022

3. Tata Steel's EN 15804 verified EPD programme, Product Category Rules Part 2 – Steel Lintels, V1 March 2022

4. ISO 14044:2006, Environmental management - Life Cycle Assessment - Requirements and guidelines

5. ISO 14025:2010, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

6. ISO 14040:2006, Environmental management - Life Cycle Assessment - Principles and framework

7. EN 15804:2012+A2:2019, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

8. EN 10346:2015, Continuously hot-dip coated steel flat products for cold forming

9. EN 845-2:2013+A1:2016, Specification for ancillary components for masonry - lintels

10. BS 5977:Part 2:1983, Lintels. Specification for prefabricated lintels (AMD 4827)

11. Building Regulations (England and Wales) Part L, Conservation of fuel and power, updated October 2015

12. ISO 9001:2015, Quality management systems

13. ISO 14001:2015, Environmental management systems

14. BBA Certification, British Board of Agrément product certification

15. BES 6001, Responsible sourcing of construction products

16. NHBC Standards 2021 edition, National House Building Council, Milton Keynes

17. LABC, Local Authority Building Control

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19. Documentation of GaBi: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2022 http://documentation.gabi-software.com

20. EUROFER in cooperation with the World Steel Association, 'A methodology to determine the LCI of steel industry co-products', February 2014

21. World Steel Association: Life cycle assessment methodology report, 2017

22. Sansom M and Avery N, Reuse and recycling rates of UK steel demolition arisings, Proceedings of the Institution of Civil Engineers, Engineering Sustainability 167, June 2014, Issue ES3, (Tata Steel/ EUROFER survey of members of the National Federation of Demolition Contractors (NFDC) for 'light structural steel')

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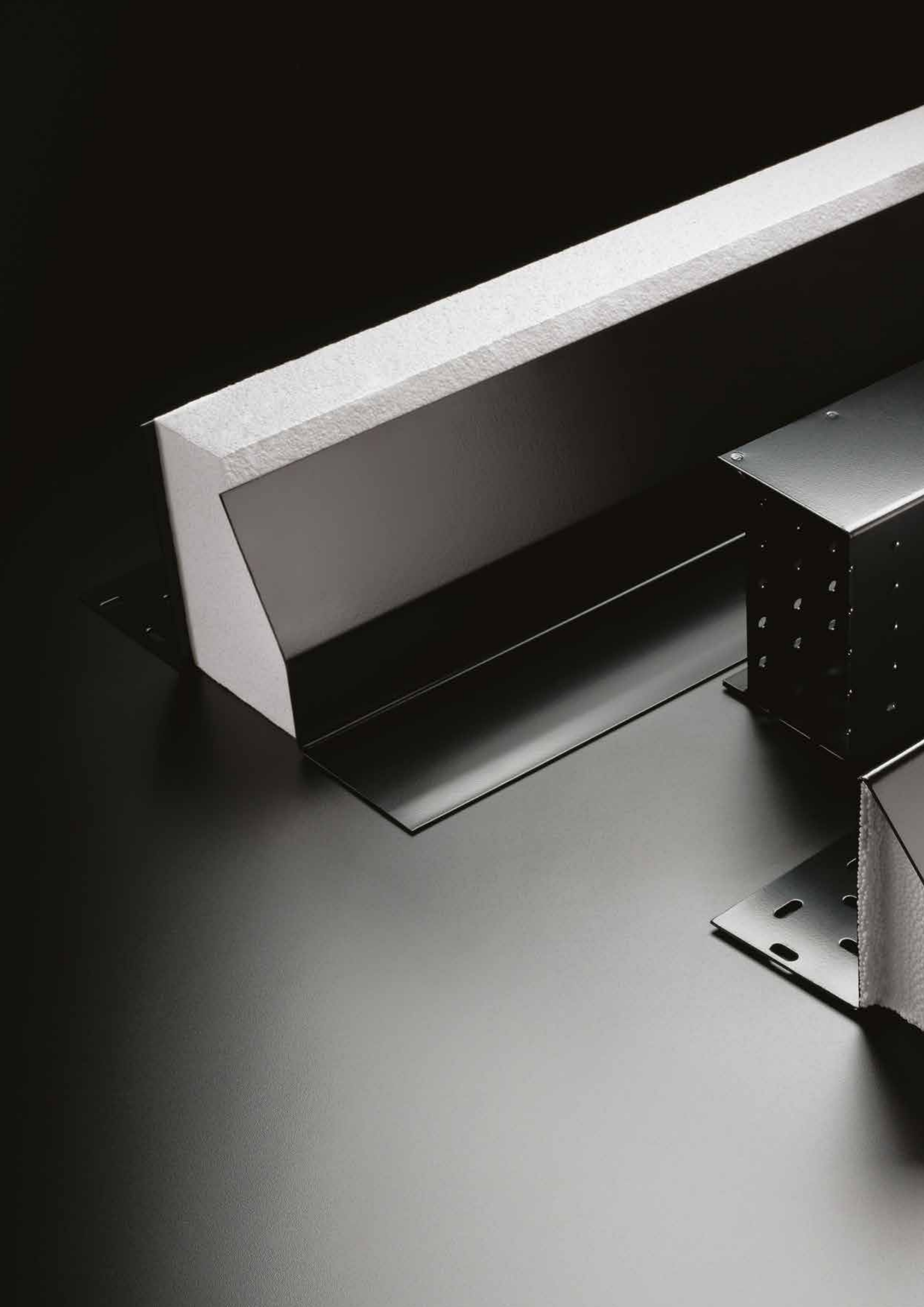

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